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Fujiwara Wagner



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(Demand Driven Simulation Method (DDSM))

LOOP,EPANET



(Head Driven

Simulation Method (HDSM))

(Tabesh, 1998; Tabesh et al., 2002; Gupta, Bhawe, 1996; Fujiwara, .
Ganesharaja, 1993; Germanopoulos, (1985); Wagner et al., 1988)

(Bhave, 1981)

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Tabesh (1998)

Germanopoulos (1985) .

$$Q_j^{avl} = Q_j^{req} \left[1 - b_j e^{-c_j \left(\frac{H_j - H_j^{\min}}{H_j^{des} - H_j^{\min}} \right)} \right] \quad ()$$



$$:H_j^{\min} \quad :H_j \quad :Q_j^{req} \quad :Q_j^{avl} :$$

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$$:H_j^{des} .$$

$$:b_j , c_j .$$

$$Q_j^{avl} = Q_j^{req}$$

$$H_j = H_j^{des} \quad ()$$

$$.Q_j^{avl} = 0.932Q_j^{req}$$

$$H_j - H_j^{\min} = 0.46(H_j^{des} - H_j^{\min}) \quad ()$$

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() Gupta, Bhawe (1996) .

$$Q_j^{avl} = Q_j^{req} \left[1 - 10^{-c_j \left(\frac{H_j - H_j^{\min}}{H_j^{des} - H_j^{\min}} \right)} \right] \quad ()$$

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$$c_j \left(\frac{H_j - H_j^{\min}}{H_j^{des} - H_j^{\min}} \right)$$

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(Tabesh, Tanyimboh, 1997)

c_j

$$H_j = H_j^{des}$$

Wagner et al. (1988) .

$$Q_j^{req} \quad Q_j^{avl}$$



$$\begin{cases} Q_j^{avl} = Q_j^{req} & \text{if } H_j \geq H_j^{des} \\ Q_j^{avl} = Q_j^{req} \left(\frac{H_j - H_j^{\min}}{H_j^{des} - H_j^{\min}} \right)^{0.5} & \text{if } H_j^{\min} < H_j < H_j^{des} \\ Q_j^{avl} = 0 & \text{if } H_j \leq H_j^{\min} \end{cases} \quad ()$$

Fujiwara, Ganesharaja .

$$\begin{cases} Q_j^{avl} = Q_j^{req} & \text{if } H_j \geq H_j^{des} \\ Q_j^{avl} / Q_j^{req} = \frac{\int_{H_j^{\min}}^H (H - H_j^{\min})(H_j^{des} - H)dH}{\int_{H_j^{\min}}^{H_j^{des}} (H_j - H_j^{\min})(H_j^{des} - H)dH} & \text{if } H_j^{\min} < H_j < H_j^{des} \\ Q_j^{avl} = 0 & \text{if } H_j \leq H_j^{\min} \end{cases} \quad () \quad (1993)$$

.(Tabesh, 1998)

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HDSM

Gupta,Bhave (1996), Fujiwara,

Tabesh (1998)



Ganesharaja (1993),

Tabesh (1998),

Tabesh et al. (2002), Tanyimboh et al. (2002)

$$F_j = \left(\sum_{i \in I_j} \left(\frac{H_j - H_i}{K_{ij}} \right)^{(1/n)} \right)_{OUT} - \left(\sum_{i \in I_j} \left(\frac{H_j - H_i}{K_{ij}} \right)^{(1/n)} \right)_{IN} - Q_j^{avl} = 0 \quad ()$$

$l : n \quad j \quad : Q_j^{avl} \quad j \quad : F_j$

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(Tabesh,

.1998)

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.(Tabesh, 1998)



Cullinane et al. (1992).

$$\alpha_l = \frac{.21218D_l^{1.462131}}{(.00074D_l^{2.85} + .21218D_l^{1.462131})} \quad \forall l = 1, \dots, NP \quad (1)$$

Su et al. (1987)

$$\alpha_l = e^{-[\mu_l L_l]} \quad \forall l = 1, \dots, NP \quad (2)$$

$$\mu_l = \frac{.6858}{D_l^{3.28}} + \frac{2.7158}{D_l^{1.3131}} + \frac{2.7658}{D_l^{3.5792}} + .042 \quad \forall l = 1, \dots, NP \quad (3)$$

$$\begin{cases} R_j^L = \frac{1}{Q_j^{req}} \left[\sum_{l=0}^{NP} P(l) Q_j^{avl} \right] \\ R_j^U = 1 - \frac{1}{Q_j^{req}} \left[\sum_{l=0}^{NP} P(l) (Q_j^{req} - Q_j^{avl}(l)) \right] \\ R_j = \frac{R_j^L + R_j^U}{2} \end{cases} \quad (4)$$

$$H_j^{\min} \cdot (Q_j^{req})$$

$$H_j^{des}$$



Gupta, (1996)

Cullinane et al., (1992)

Bhave

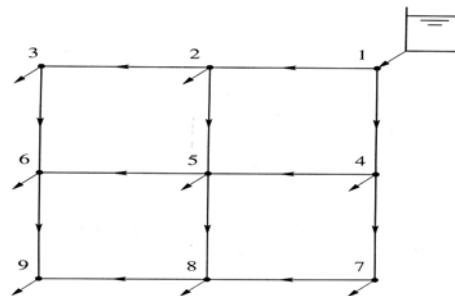
Germanopolous (1985)

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Su et al. (1987), Cullinane et al., (1992)

Su et al., (1987)

(Tabesh (1998))



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	()				(m ³ /s)			
	EPANET	Tanyimboh	Tabesh	Tabesh,Vaseti	EPANET	Tanyimboh	Tabesh	Tabesh,Vaseti
2	83.19	88.20	88.02	88.211	-0.0208	-0.0208	-0.0208	-0.0208
3	57.14	71.36	70.94	71.389	-0.0208	-0.0208	-0.0208	-0.0208
4	83.19	88.20	88.02	88.207	-0.0208	-0.0208	-0.0208	-0.0208
5	56.82	71.99	71.58	72.025	-0.0208	-0.0208	-0.0208	-0.0208
6	-20.25	36.68	35.33	36.728	-0.0208	-0.0208	-0.0208	-0.0208
7	57.14	71.39	70.94	71.38	-0.0208	-0.0208	-0.0208	-0.0208
8	-20.25	36.68	35.33	36.733	-0.0208	-0.0208	-0.0208	-0.0208
9	-177.46	5.27	4.82	5.282	-0.0625	-0.0262	-0.0255	-0.0262



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شماره گره	H (m)				Q ^{av1} (m ³ /s)			
	Wagner	Fujiwara	Gupta	Germanopolous	Wagner	Fujiwara	Gupta	Germanopolous
1	100	100	100	100	0.1719	0.16979	0.17294	0.16825
2	88.211	88.478	88.08	88.667	-0.0208	-0.0208	-0.0208	-0.0208
3	71.389	72.15	71.01	72.651	-0.0208	-0.0208	-0.0208	-0.020799
4	88.207	88.467	88.07	88.666	-0.0208	-0.0208	-0.0208	-0.0208
5	72.025	72.844	71.63	73.343	-0.0208	-0.0208	-0.0208	-0.020799
6	36.728	39.532	35.32	41.359	-0.0208	-0.0208	-0.0208	-0.020589
7	71.38	72.131	71.00	72.65	-0.0208	-0.0208	-0.0208	-0.020799
8	36.733	39.543	35.33	41.359	-0.0208	-0.0208	-0.0208	-0.020589
9	5.282	12.716	1.495	16.564	-0.0262	-0.024119	-0.0273	-0.022969

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	Wagner	Fujiwara	Gupta	Germanopolous
1	82.545	81.544	83.054	80.801
2	99.987	99.986	99.989	99.986
3	99.96	99.958	99.956	99.951
4	99.987	99.986	99.989	99.986
5	99.99	99.994	99.999	99.989
6	99.917	99.92	99.953	98.911
7	99.96	99.958	99.955	99.951
8	99.917	99.92	99.953	98.911
9	41.888	38.52	43.572	36.678

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HDSM

DDSM



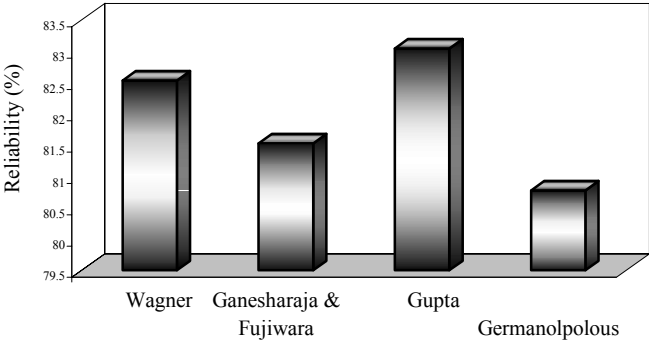
HDSM

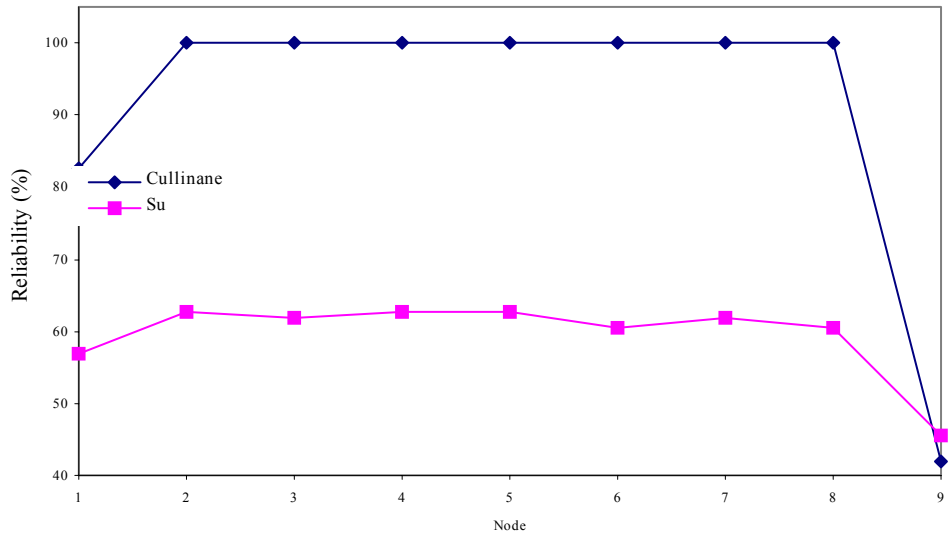
Fujiwara ,Ganesharaja (1993) Wagner (1988)

Fujiwara ,

Wagner (1988)

Ganesharaja (1993)





(Reliability)

Cullinane et al.(1992)

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